UFC 1-300-01
10 May 2000

UNIFIED FACILITIES CRITERIA (UFC)

CRITERIA FORMAT STANDARD

U.S. ARMY CORPS OF ENGINEERS (Preparing Activity)

NAVAL FACILITIES ENGINEERING COMMAND

AIR FORCE CIVIL ENGINEER SUPPORT AGENCY

UNIFIED FACILITIES CRITERIA (UFC)

CRITERIA FORMAT STANDARD

Record of Changes (changes indicated by **1**\ ... /**1**/)

Change No.	Date	Location

This UFC supersedes Military Handbook MIL-HDBK-1006/3c, dated 31 August 1995, and Technical Instruction TI 800-00, dated 22 May 1998.

FOREWORD

The Unified Facilities Criteria (UFC) system provides planning, design, construction, operations and maintenance criteria, and applies to all service commands having military construction responsibilities. UFC will be used for all service projects and work for other customers where appropriate.

UFC are living documents and will be periodically reviewed, updated, and made available to users as part of the Services' responsibility for providing technical criteria for military construction. Headquarters, United States Army Corps of Engineers (HQUSACE), Naval Facilities Engineering Command (NAVFAC), and Air Force Civil Engineering Support Agency (AFCESA) are responsible for administration of the UFC system. Technical content of UFC is the responsibility of the preparing tri-service committee. Recommended changes with supporting rationale should be sent to the respective service proponent office, as follows:

- HQUSACE, ATTN: CECW-E, 20 Massachusetts Ave., NW, Washington, DC 20314-1000 or the Recommended Changes To Engineering Documents page on the TECHINFO site listed below.
- Commander, Atlantic Division, Naval Facilities Engineering Command, 1510 Gilbert Street (ATTN: NAVFAC Criteria Office), Norfolk, Virginia 23511-2699 or crit_innov_07@efdlant.navfac.navy.mil, by commercial telephone (757)322-4200 or DSN 262-4200, or by facsimile machine to (757) 322-4416
- Air Force Civil Engineer Support Agency, 139 Barnes Drive, Tyndall Air Force Base, Florida 32403-5319 or larry.spangler@afcesa.af.mil.

UFC are effective upon issuance. UFC are distributed only in electronic media from the following sources:

- USACE TECHINFO Internet site http://www.hnd.usace.army.mil/techinfo/index.htm.
- NAVFAC Criteria Office Internet site http://criteria.navfac.navy.mil/criteria.
- Construction Criteria Base (CCB) system maintained by the National Institute of Building Sciences at Internet site http://www.nibs.org/ccb/.

Hard copies of UFC printed from electronic media should be checked against the current electronic version prior to use to ensure that they are current.

AUTHORIZED BY:

Dwight A. Beranek, P.E.
Chief, Engineering and Construction Division
U.S. Army Corps of Engineers

Dr. Get Moy, P.E.
Chief Engineer and
Director of Planning and Engineering,
Naval Facilities Engineering Command

Michael Aimone, P.E.
Deputy Civil Engineer
Deputy Chief of Staff, Installations & Logistics
Department of the Air Force

Frank Lane
Director of Analysis & Investment
Deputy Under Secretary of Defense
for Installations
Department of Defense

CONTENTS

FIGURES

TABLES

CHAPTER 1

INTRODUCTION

1-1 **PURPOSE AND SCOPE**. This document provides standards for the preparation of Unified Facilities Criteria (UFC). UFC are published by the services under the auspices of the tri-service Engineering Senior Executive Panel (ESEP). The ESEP is composed of the Deputy Under Secretary of Defense, Installations; the U.S. Army Corps of Engineers (HQUSACE), Chief, Engineering and Construction; the Naval Facilities Engineering Command (NAVFAC), Chief Engineer; and the Air Force Deputy Civil Engineer (HQ USAF/ILE). UFC are prepared by tri-service committees called discipline working groups. Publication of UFC is only by electronic media on the Internet at the USACE TECHINFO site, the NAVFAC Criteria Office Internet site, , and the National Institute of Building Sciences (NIBS) Construction Criteria Base (CCB) site and by CD-ROM from NIBS.

1-2 **APPLICABILITY**. This UFC applies to all service elements and contractors preparing UFC.

1-3 **REFERENCES**. Appendix A contains a list of references used in this UFC and illustrates the format for listing references.

1-4 **CONTENT AND FORMAT**. UFC are used to rapidly provide technical information to plan, design, construct, operate, and maintain shore facilities. UFC are essential communications between policy- and standards-making elements and execution elements. Each tri-service discipline working group is responsible for the technical content, format, and overall quality of their UFC. This UFC establishes the general appearance of UFC publications. The UFC format is designed to facilitate ease of preparation and use. A template of this guidance document in MS Word® format is available on the USACE TECHINFO Internet site.

1-4.1 **Content Guidance**. UFC should provide technical information in a well-written, straightforward manner. UFC should reference non-Government standards to the greatest extent where appropriate, and should avoid repeating commercially available criteria. Consideration should be given to breaking large documents into smaller documents to facilitate updating. Content should assuremaximum functionality while addressing all life, safety, and health requirements. Using lessons learned and technological innovation, the criteria should be developed to promote lowest life-cycle cost, maximum environmental responsiveness and energy efficiency, quality of life, and increased productivity. Write criteria to the level of the experienced engineer and architect.

1-4.2 **Electronic Format**. UFC will be distributed on the Internet in Adobe® Portable Document Format (PDF) according to paragraph 2-6.

1-4.3 **Variations in Format**. The format prescribed herein is intended to provide uniformity and will apply to most UFC. Deviations from the prescribed format may be necessary to effectively communicate a message. Examples include design guides that contain numerous graphics and field handbooks in non-standard sizes. Variations from the prescribed format should first be coordinated with the appropriate service office: HQUSACE (CECW-E) for the Army, the NAVFAC Criteria Office for the Navy, or HQ AFCESA/CES for the Air Force.

1-5 **COPYRIGHT RELEASES**. If copyrighted material is used in a UFC, obtain written permission from the copyright holder. Identify the material properly in the UFC according to the requirements of the copyright holder.

1-6 **PUBLICATION DATE**. The publication date is the date the UFC is approved by the tri-service Unified Design Guidance Coordinating Panel (UDGCP). To expedite dissemination of new criteria for multiple-discipline UFC, the preparing activity may publish a basic UFC, which later may include additional chapters or appendixes. These later chapters or appendixes, when approved, will be published as changes. These changes will bear the same publication date in the header as the basic UFC but will be identified at the top of the first page with the change number and date of the change. lssue dates for these chapters and appendixes will be identified by the publication change dates documented on the UFC title page. (Refer to paragraph 2-4.)

CHAPTER 2

REQUIREMENTS

2-1 CONTENT

2-1.1 **Organization**. Use one of the following two outlines. Longer UFC should follow the chapter format.

Without Chapters:

Front Matter
- *Cover*
- *Title/change page*
- *Foreword*
- *Table of Contents*

Main Text
- *Introduction*
  - *Background*
  - *Purpose*
  - *Scope*
- *References**
- *Technical requirements and guidance*

Glossary

Appendixes
- *References**
- *Supporting technical guidance*

Index

OR

With Chapters:

Front Matter
- *Cover*
- *Title/change page*
- *Foreword*
- *Table of Contents*

Main Text
- *Chapter 1 – Introduction*
  - *Background*
  - *Purpose*
  - *Scope*
  - *References**
  - *Additional general guidance*
- *Chapter 2 (and following)*
  - *Technical requirements and guidance*

Glossary

Appendixes
- *References**
- *Supporting technical guidance*

Index

*Refer to paragraphs 2-1.3.2 and 2-1.5.1.

2-1.2 Front Matter

2-1.2.1 **Cover, Title Page, and Foreword**. These pages are mandatory. Prepare them according to the example provided by this UFC. The foreword is identical for all UFC. Identify the preparing activity on the cover parenthetically.

2-1.2.2 **Table of Contents**. A table of contents is not required for UFC with fewer than 30 pages (including front matter and appendixes). As a minimum, the table of contents should list titles of main paragraphs and first level subparagraphs. Format the table of contents according to the example in this UFC. For multiple-discipline UFC (e.g., UFC

Series 4 -- Multi-disciplinary and Facility-specific Design), each chapter and appendix may have a table of contents which lists titles of main paragraphs and first-level subparagraphs within the chapter or appendix. The main document table of contents then lists only chapter and appendix titles. Do not list the front matter or the index in the table of contents.

2-1.3 **Main Text**

2-1.3.1 **Introduction**. As a minimum, this paragraph presents the purpose and scope of the UFC. Background information is not mandatory; but include it when such supplementary information helps the user better understand how to use the UFC.

2-1.3.2 **References**. List all publications cited in the UFC, including appendixes, and any additional publications needed to use the UFC. If the list is longer than one page, refer the user instead to Appendix A and list all references there (refer to paragraph 2-1.5.1).

2-1.4 **Glossary**. The Glossary lists and defines acronyms, abbreviations, and uncommon terms used in the UFC. A glossary is not mandatory but should be used when the main text would be complicated if it included a large number of definitions, or when it contains a large number of acronyms or abbreviations (20 or more). Format the Glossary into two sections -- the first for acronyms and abbreviations, the second for terms -- each organized alphabetically.

2-1.5 **Appendixes**. Appendixes containing technical guidance should be written in the same style as the main text (refer to paragraph 2-3). Exception: Previously published material should retain the original format.

2-1.5.1 **Appendix A**. Use Appendix A to list references according to the example provided by Appendix A of this UFC. If references already have been listed in the main text (refer to paragraph 2-1.3.2), Appendix A and subsequent appendixes may be used for supplementary technical guidance.

2-1.6 **Index**. An index is not required for a UFC unless the UFC is long and complex. Indexes are difficult to develop and maintain and should be used only when absolutely necessary. Electronic formats allow search and find routines to locate occurrences of words and phrases.

2-2 **FORMAT**

2-2.1 **Page Layout**. Prepare final electronic drafts using an 8.5- by 11-inch page size. Foldout sheets should be avoided.

2-2.1.1 **Margins**. Use 1-inch margins left and right; 0.75-inch margins top and bottom. Position marginal copy (headers and page numbers) one-half inch from the edge of the page. All text is left-aligned at the margin, including paragraph numbers, except as noted for headers and page numbers.

2-2.1.2 **Font**. Use a 12-point sans serif font. Helvetica, Arial, and Universal are acceptable examples. Ensure color fonts appear legible when printed black and white.

2-2.1.3 **Paragraphs**.

2-2.1.3.1 **Numbering**. Number all main text and appendix text paragraphs. In main text, number paragraphs and subparagraphs consecutively from beginning to end, using a period to separate the numbers representing each breakdown. Limit subparagraphs to four numbers separated by periods. (Label subparagraphs according to the following example.) Where a UFC is divided into chapters, number each paragraph consecutively within the chapter, beginning each paragraph number with the applicable chapter number followed by a dash. Number paragraphs consecutively within each appendix, beginning each paragraph number with the letter designation of the appendix followed by a dash (e.g., A-1, A-1.1). Use this UFC as a guide.

Use no more than two unnumbered paragraphs beneath any numbered paragraph. Indent the first line of unnumbered paragraphs 10 character spaces from the left margin. Place all other lines flush with the left margin. Leave a blank line between paragraphs.

Example:
2 CHAPTER
2-1 MAJOR PARAGRAPH
2-1.1 First level subparagraph
2-1.2 First level subparagraph
2-1.2.1 Second level subparagraph
2-1.2.1.1 Third level subparagraph
2-1.2.1.2 Third level subparagraph
2-1.2.2 Second level subparagraph

2-2.1.3.2 **Titles**. Each major paragraph must have a paragraph title in uppercase. Titles are optional for subparagraphs, but should be applied consistently; i.e., if any subparagraphs of a particular paragraph have titles, all subparagraphs in the same sequence at that level must have titles. Present titles of subparagraphs with initial capital letters only. Indent paragraph title 10 character spaces from the left margin. If text follows the title, end the title with a period and begin the paragraph text on the same line. Place all other lines flush with the left margin.

2-2.1.4 **Headers**. Each page of a UFC, including the cover and the title page, will bear the UFC designation and publication number and the publication date as marginal copy, right-justified, one-half inch from the top of the page. The short title occupies the first line; the publication date (refer to paragraph 1-6) appears directly beneath the short title.

2-2.1.5 **Page Numbers**. Center page numbers horizontally in the footer (bottom marginal copy area) of each page.

2-2.1.5.1 **Front Matter**. Page numbers will not appear on the cover, title page, and foreword. Beginning with the first page of the table of contents, number pages consecutively with lowercase roman numerals.

2-2.1.5.2 **Main text**. Beginning with the first page of main text, number pages consecutively with Arabic numerals. For UFC with chapters, number pages consecutively within each chapter; i.e., start each page number with the number of the chapter followed by a hyphen. Example: For a Chapter 3 with 29 pages, begin the chapter with page 3-1 and continue to 3-29. Chapter 4 then begins with page 4-1.

2-2.1.5.3 **Glossary**. Number Glossary pages consecutively beginning with Glossary-1.

2-2.1.5.4 **Appendixes**. Number Appendix A pages consecutively beginning with A-1; number Appendix B pages beginning with B-1; likewise with all remaining appendixes.

2-2.1.5.5 **Index**. Number Index pages consecutively beginning with Index-1.

2-2.2 **Tables**. Position each table after the paragraph which first references it. If this causes the table to break between two pages, the entire table may be placed on the next page. Number tables consecutively, starting with Table 1. If a UFC has chapters, number tables consecutively within each chapter, using the chapter number first, followed by a dash (Example: for Chapter 2, Tables 2-1, 2-2, 2-3). Format tables according to the following example. Font size may be reduced to a minimum 10-point to enhance the presentation of data within a table.

Table 2-1. Example Table

Nomenclature	T.O. 35E8-2-10-4 Illustration	Part Number	National Stock Number	Units per Trailer	CAGE Code
Coupling, female, Series 56	19-17	5601-6-6S	4730-00-939-5533	1	01276
Washer, flat	19-18	495-060-A3		1	51506
Dust cap	19-20	5657-6	5340-00-071-3829	1	01276
Dust cap	19-21	5659-6	5340-00-071-3830	1	01276
Coupling, male, Series 56	19-39	5602-6-6S	4730-01-063-9285	1	01276
Wacker HPU	19-1	52D9014-101	4940-01-356-3478	2	21439
Hose assy.	30-7	52C8620-1	4720-01-254-0957	2	21439

2-2.3 **Figures**. Figures may be drawings or photographs. Figures may be color or black and white. Ensure color fonts appear legible when printed black and white. However, black and white is encouraged due to the expense of color copies. Position each figure after the paragraph which first references it. If the figure is too large for the remaining space on the page, allow text to fill the remainder of the page and place the figure at the top of the next page. If figures are so numerous they disrupt the flow of text, group them at the end of the chapter. If more than one chapter is affected, group all figures in an appendix. To conserve disk space, figures should be provided in JPG, GIF, or WMF format; BMP is also acceptable. Embed (do not link) figures within the document file. Minimum font size for labels and callouts within figures is 8-point. The rules for numbering figures are the same as those for tables.

Figure 2-1. Example Figure

2-2.4 **References in Text**. Present titles of other referenced documents and publications in italics according to the examples in this UFC. Do not use UFC to republish material available from another source. Information extracted from other publications for inclusion in a UFC must not exceed one page in length. Present such extracted material in quotation marks, indented one-half inch from both right and left margins, and provide appropriate references.

2-2.5 **Footnotes**. Use a footnote to give credit for a legal citation, copyrighted, or quoted material. Identify the footnote with an Arabic superscript number or asterisk. Number footnotes consecutively throughout the UFC. If the UFC is divided into chapters, number the first footnote in each chapter as "1." Then number the other footnotes consecutively throughout the chapter. Place footnotes at the bottom of the same page containing the referenced text, separating them from the main text by a hairline rule.

2-3 **WRITING STYLE**. Write in a direct, active voice with simple, concise sentences as much as possible. Use language appropriate for the user with the experience level required by the subject matter. Avoid ambiguous, indefinite terms such as "too short" or "relatively simple." Quantify whenever possible. Define what applies before using "applicable." Do not use "and/or"; do not use the virgule (/) to substitute for "and" or "or." Do not use "etc."; use "e.g.," "for instance," or "such as."

2-3.1 **Mood, Tense, and Voice**. Use the imperative mood (e.g., install equipment), the future tense "will," and "must" to prescribe mandatory actions and procedures. Use "can" and "may" to permit choice and identify guidance. Use "should" to indicate desirable procedures that are advisory in nature. Use of the first and second person pronouns "we" and "you" is acceptable. The third person singular pronouns "he" or "she" must meet neutral language requirements. Often, rewriting a sentence eliminates the need for repetitive "he or she"; e.g., "Information managers complete their training" rather than "the information manager completes his or her training."

2-3.2 **Abbreviations and Acronyms**. If the UFC contains more than 20 different abbreviations and acronyms, they should be listed and defined in Appendix A, *Glossary*.

2-3.2.1 **Abbreviations**. Follow guidance in the *United States Government Printing Office (GPO) Style Manual* regarding abbreviations, terms of measure, and use of signs and symbols. Use abbreviations consistently throughout a UFC. Spell out proper names on first use, and present the abbreviation immediately following in parentheses; use the abbreviation thereafter. Do not use symbols in the text; e.g., use the word "inches," not the symbol." Use of % is acceptable. Spell out degrees; do not use the symbol (º). Greek symbols are acceptable. Symbols may be used in figures and tables.

2-3.2.2 **Acronyms**. When use of an acronym will improve reader understanding of the text, provide the complete term the first time it appears, followed by the acronym in parentheses. Then, use the acronym consistently throughout the remainder of the UFC.

2-3.3 **International System of Units (SI)(Metric)**. Provide dimensions in SI with inch-pound ("English") units in parentheses. Calculate the SI dimension to the same level of significance as the inch-pound. Use "hard" SI sizes where industry standards exist, products are readily available, and it is economically feasible. Dimensions in figures and tables must also be presented in both SI and inch-pound units. Refer to IEEE SI-10, *Standard for Use of the International System of Units (SI): The Modern Metric System* for guidance on the use of SI units. Extracts from non-government standards (NGS) can be used as written. Criteria prepared to supplement requirements of NGS may use units appropriate for the NGS.

2-3.4 **Miscellaneous**. Follow the example of this UFC and guidance in *United States Government Printing Office (GPO) Style Manual* for rules of capitalization, punctuation, grammar, and syntax.

2-4 **FORMS.** Forms may be developed for specific data collection tasks required within a UFC. To make photocopying easier, each form should occupy a separate page.

2-5 **CHANGES AND REVISIONS**. Changes and revisions to UFC must be coordinated with and approved by the responsible tri-service Discipline Working Group.

2-5.1 **Changes**. A change is appropriate when less than 40 percent of the total number of UFC pages will contain new material. Changes may include the addition of entire chapters or appendixes. The preparing activity issues a new electronic file which incorporates all changes and retains the date of publication prior to the changes.

2-5.1.1 **Marking Text**

2-5.1.1.1 **Preparing Activity**. The preparing activity lists each change on the title page under the record of changes, and marks the start of changed text with the number of the change enclosed with right slant virgule symbols **(\X|)** and the end of changed text with left slant virgule symbols **(/*X*/)** in bold type. Respectively, the letter "***X"*** represents the number of the change (see Figure 2-2). These change markings are not used for complete chapter replacements; instead, complete chapter replacements must have the change number and date identified at the top of the first page of the chapter (see Figure 2-3).

2-5.1.1.2 **Other Proponents**. On multiple-proponent UFC, proponents other than the preparing activity mark text changes with the letter "X" enclosed with virgule symbols at the start and end of changed text. Proponents other than the preparing activity will not assign change numbers or record changes on title pages. As part of creating the new electronic file, the preparing activity will replace the letter "X" with the appropriate change number and update the title page accordingly.

2-5.2 **Revisions**. Accomplish a complete revision when more than 40 percent of a UFC contains changes. The preparing activity issues a new electronic file, incorporating

all changes. Previously recorded changes are removed from the title page, and all change markings are deleted from text. The revision will bear the new publication date according to paragraph 1-6.

2-6 **ASSIGNING PUBLICATION NUMBERS**. The preparing activity will assign a publication number to each UFC according to Appendix B.

2-7 **ELECTRONIC FORMAT AND MEDIA**. Use MS Word® or an equivalent software application which can easily and accurately convert UFC source files to Adobe® PDF. Drafts and final manuscripts must incorporate figures and tables in proper position within the electronic source files so that UFC printed from the files will accurately represent the UFC viewed electronically. Upon approval of the UFC, the preparing activity provides the electronic files (MS Word® and PDF) to the other service offices (refer to the Foreword) by e-mail or file transfer protocol (FTP), or on 3½-inch disk, zip disk, or compact disc. The preparing activity must ensure that NIBS gets the PDF file for publication on the CCB. Additionally, the services may request that the preparing activity bookmark the Adobe® PDF file to allow prompt navigation through the UFC.

2-8 **INDEX OF UFC**. Upon approval of a UFC, each service will update itsown master list of UFC.

2-9 **ARCHIVE OF CURRENT AND SUPERSEDED UFC**. Each service is responsible for maintaining records of current and superseded UFC, including changes and revisions, for each UFC for which they are the preparing activity.

2-10 **FINAL UFC APPROVAL**. Each UFCshould be reviewed by cognizant technical personnel for technical accuracy prior to submission to the UDGCP for final approval. Extend the opportunity for review to major commands, facility users, and private industry asapplicable.

Figure 2-2. Example Change to UFC

CHAPTER 2

PRELIMINARY DESIGN DATA

2-1 **GENERAL**. **\1**The need for subsurface drainage and frost protection must be identified during the design stage to enable incorporation of appropriate features into the pavement design.**/1/** Verification of design assumptions is important to obtain reliable designs. If during construction any of the site conditions were found different than those assumed in the design, the design may have to be modified. Some site-related factors affect the need for frost protection and the need for subsurface drainage. In this section, investigation of those site factors is discussed.

2-2 **INVESTIGATION FOR FROST DESIGN**. The key factors that determine the need for frost protection include type and gradation of subgrade, climate, and depth of groundwater table. Frost heaving will occur only if the following three conditions exist:

- Presence of frost-susceptible material.
- Penetration of freezing temperatures into the susceptible material.
- Available supply of water.

\1The investigation for frost design involves evaluating site conditions for the determination of the presence of these conditions.**/1/**

2-2.1 **Subsoil Investigations**. Frost action is detrimental if it results in differential heaving, which is caused by variations in subsurface conditions. Variability of subsurface conditions, therefore, is an important consideration for frost design. Subsoil investigation should include assessment of horizontal and vertical variations in subgrade soil type, natural moisture content, and water table elevations. In various situations, variable pavement sections may be needed for different parts of the project to accommodate the differences in subsurface conditions along the project. These conditions must be identified during the subsoil investigation. Consider removing isolated pockets or sections of frost-susceptible soil to eliminate abrupt changes in subgrade conditions.

2-2.2 **Classification of Soils for Frost Susceptibility**. Frost susceptibility of a soil is the potential for the formation of ice lenses in the soil under freezing conditions. Because the water needed for formation and growth of ice lenses is supplied through capillary action, severe frost heave occurs in soils with a high capillary rate. As the freezing temperatures penetrate deeper into the ground, a heavy formation of ice lenses takes place at each successive level, resulting in severe frost heave. All inorganic soils that contain more than 3% by weight of particles finer than 0.02 mm in diameter are generally frost-susceptible.

Figure 2-3. Example Chapter Replacement

UFC 1-300-01
10 May 2000

Change 1
15 June 2000

CHAPTER 2

FROST PROTECTION DESIGN

2-1 **NEED FOR FROST PROTECTION**. Differential frost heaving can cause pavement cracking, significant roughness, and a drastic reduction in pavement service life. If prevented from free movement, frost heaving can exert enormous forces on pavements, structures, or utilities. The forces involved are so great that any attempt to accommodate frost heaving by providing a more substantial pavement structure is not practical. The only practical solution is prevention. Even if frost action does not result in significant heaving, the excess free water during thaw periods, and consequent softening of the subgrade and base material, can also be detrimental to pavement performance. If the investigation for frost design (refer to Section 2) reveals that frost action is possible at the project site, frost protection design must be considered. In general, the following combination of conditions denotes a potential for frost action and the need for frost protection:

- Presence of frost-susceptible soil.
- Groundwater level within 5 ft (1.5 m) of the proposed subgrade elevation.
- Frost penetration depth greater than the planned overall thickness of the pavement structure (typically, design freezing index greater than 150 degrees F (83.3 degrees C)).

2-2 **DESIGN APPROACH**. There are two basic approaches to frost protection: (a) complete prevention of subgrade freezing and (b) limiting frost penetration into the subgrade. The first method involves providing a sufficient cover over the frost-susceptible material to prevent penetration of freezing temperatures into the subgrade. This may require removing and replacing a certain thickness of frost-susceptible material or providing a layer of non-susceptible fill, if the combined thickness of the pavement structure and any fills needed for geometric requirements are not sufficient to provide adequate cover. The second approach allows limited frost penetration into the subgrade. The applicability and details of each of these design approaches are discussed in the following.

PPENDIX A

REFERENCES

GOVERNMENT PUBLICATIONS:

1. Department of the Navy

Standardization Documents Order Desk 700 Robbins Avenue, Bldg. 4D Philadelphia, PA 19111-5094	MIL-HDBK-1008, Fire Protection for Facilities Engineering, Design, and Construction

2. U.S. Government Printing Office

Superintendent of Documents U.S. Government Printing Office Washington, DC 20402	U.S. Government Printing Office (GPO) Style Manual

NON-GOVERNMENT PUBLICATIONS:

3. Institute of Electrical and Electronics Engineers Inc. (IEEE) 445 Hoes Lane, P.O. Box 1331 Piscataway, NJ 08855-1331	Standard for Use of the International System of Units (SI): the Modern Metric System

APPENDIX B

NUMBERING OF UNIFIED FACILITIES CRITERIA

UFC SERIES 1 -- POLICY, PROCEDURES, AND GUIDANCE

1-100 Series -- General
1-200 Series -- Policy
1-300 Series -- Procedures and Guidance
1-300-01 UFC Format Standard
1-400 Series -- Reserved
1-500 Series -- Reserved
1-600 Series -- Reserved
1-700 Series -- Reserved
1-800 Series -- Reserved
1-900 Series – Miscellaneous

UFC SERIES 2 -- MASTER PLANNING *(Reserved for Future Use)*

2-100 Series -- Comprehensive Master Planning
2-200 Series -- Land Use Planning
2-300 Series -- Utility System Planning
2-400 Series -- Transportation System Planning
2-500 Series -- Spatial Data Systems
2-600 Series -- Installation Design Guides
2-600-01 Installation Design
2-700 Series -- Outdoor Recreation Planning
2-800 Series -- Planning in the Noise Environment
2-900 Series -- Miscellaneous

UFC SERIES 3 -- DISCIPLINE-SPECIFIC CRITERIA

3-100 Series – Architecture and Interior Design ***(Architectural / Interior Design Discipline Working Group)***
3-100 General
3-110 Architectural Design
3-120 Interior Design
3-130 Reserved
3-140 Reserved
3-150 Reserved
3-160 Reserved
3-170 Reserved
3-180 Reserved
3-190 Miscellaneous
3-200 Series – Civil / Geotechnical / Landscape Architecture ***(Civil / Geotechnical / Landscape Architecture Discipline Working Group)***

3-200 General
3-210 Site Planning and Design
3-210-01 Area Planning; Site Planning and Design
3-210-01 Landscape Design and Planting
3-220 Geotechnical
3-220-01 Soils & Geology Procedures for Foundation Design of Buildings & Structures
3-230 Water
3-240 Sanitary
3-250 Vehicle Roadway Design
3-250-01 Pavement Design for Roads, Streets, Walks & Open Storage Areas
3-250-02 Circulation and Parking Design
3-260 Airfield Pavements ***(Aviation Facilities Discipline Working Group)***
3-260-01 Airfield Pavement Design
3-270 Reserved
3-280 Reserved
3-290 Miscellaneous

3-300 Series – Structural and Seismic Design ***(Structural Discipline Working Group)***
3-300 General
3-310 Structural Design Criteria
3-310-01 Load Assumptions for Buildings
3-310-02 Structural Design Criteria for Buildings
3-310-03 Structural Design Criteria for Structures Other Than Buildings
3-310-04 Seismic Design for Buildings
3-310-05 Seismic Evaluation and Rehabilitation for Buildings
3-310-06 Masonry Design for Buildings
3-310-07 Design of Cold-Formed Loadbearing Steel Stud Systems and Masonry Veneer/Steel Stud Walls
3-320 Structural Design Guidance
3-320-01 Welding Guidance for Buildings
3-320-02 Concrete Floor Slabs on Grade Subjected to Heavy Loads
3-320-03 Design and Construction of Rib Mat Slabs
3-320-04 Structural Considerations for Metal Roofing
3-320-05 Metal Building Systems
3-330 Structural Design Commentary
3-330-01 Seismic Review Procedures for Military Buildings
3-330-02 Commentary on Snow Loads
3-330-03 Selection Considerations for Roofing Systems
3-340 Hardened Structures
3-340-01 Design and Analysis of Hardened Structures to Conventional Weapons Effects
3-350 Reserved
3-360 Reserved
3-370 Reserved
3-380 Reserved
3-390 Miscellaneous

3-400 Series -- Mechanical ***(Mechanical Discipline Working Group)***
3-400 General
3-410 HVAC
3-410-01 Mechanical Design: Heating, Ventilating and Air Conditioning
3-420 Plumbing Systems
3-420-01 Plumbing
3-430 Central Plants and Energy Distribution Systems
3-430-01 Central Steam Boiler Plants
3-440 Renewable Energy Systems
3-440-01 Domestic and Service Water Active Solar Preheat Systems

3-450 Acoustics and Vibration Control
3-450-01 Noise and Vibration Control for Mechanical Equipment
3-460 Fuel Storage and Distribution Systems
3-460-01 Petroleum Fuel Facilities
3-470 Reserved
3-480 Reserved
3-490 Miscellaneous
3-490-01 Elevator Systems

3-500 Series -- Electrical ***(Electrical Discipline Working Group)***
3-500 General
3-510 Foreign Voltages
3-520 Interior Electrical Systems
3-530 Lighting Design and Controls
3-535 Airfield Lighting Systems
3-540 Electric Power Generation
3-550 Electric Power Supply and Distribution
3-555 400Hz Power Systems
3-560 Electrical Safety
3-570 Lightning and Cathodic Protection
3-570-01 Lightning Protection
3-580 Telecommunications
3-580-01 Telecommunications Distribution, Outside Plant
3-590 Miscellaneous

3-600 Series -- Fire Protection ***(Fire Protection Discipline Working Group)***
3-600 General
3-610 Fire Protection for Facilities Engineering (Presently a tri-service Military Handbook)
3-620 Maintenance of Fire Protection Systems (Tri-service Military Handbook under development)
3-630 Reserved
3-640 Reserved
3-650 Reserved
3-660 Reserved
3-670 Reserved
3-680 Reserved
3-690 Miscellaneous

3-700 Series -- Cost Engineering ***(Not an identified UDG Discipline Working Group)***
3-700 General
3-710 Code 3 Design with Parametric Estimating
3-790 Miscellaneous

3-800 Series -- Reserved
3-900 Series -- Reserved

UFC SERIES 4 – MULTI-DISCIPLINARY & FACILITY-SPECIFIC DESIGN *(Multiple / Cross Discipline Working Groups)* *(Series numbering based on DoD Uniform Real Property Category Codes per DoDI 4165.14)*

4-000 Series – Multi-Disciplinary Requirements
4-000 General
4-010 Security Engineering ***(Antiterrorism / Force Protection, Electrical, and Mechanical Discipline Working Groups)***
4-010-XX Electronic Security Systems
4-020 Sustainable Design

4-100 Series -- Operational and Training Facilities
- **4-100-00 General**
- **4-113-10 Fixed Wing Parking Apron, Surfaced**
- **4-133-10 Flight Control Towers**
- **4-141-83 Battalion Headquarters Buildings**
- **4-143-10 Ship Operations Building**
- **4-151-10 Piers**
- **4-152-10 Wharves**

4-200 Series -- Maintenance and Production Facilities
- **4-200-00 General**
- **4-213-10 Ship Repair Graving Drydocks**
- **4-214-10 Vehicle Maintenance Shops**

4-300 Series -- Research, Development, Test, and Evaluation Facilities

4-400 Series -- Supply Facilities
- **4-400-00 General**
- **4-421-80 Igloo Storage, Depot Level**

4-500 Series -- Hospital and Medical Facilities
- **4-500-00 General**
- **4-540-10 Dental Clinics**

4-600 Series -- Administrative Facilities

4-700 Series -- Housing and Community Facilities
- **4-700-00 General**
- **4-724-10 Unaccompanied Officers Quarters, Military**
- **4-730-17 Chapels**
- **4-740-10 Auditorium, General Purpose**
- **4-740-14 Child Development Centers**
- 4-740-14.1 CDC Children's Outdoor Play Areas
- **4-740-46 Consolidated Open Dining Facilities**
- **4-750-18 General Purpose Playgrounds**
- **4-750-20 Outdoor Sports Facilities**

4-800 Series -- Utilities and Ground Improvements
- **4-800-00 General**
- **4-841-30 Water Wells, Potable**
- **4-860-10 Railroad Tracks**
- 4-860-10.1 Railroad Design and Rehabilitation
- **4-861-10 Railroad Bridges**

4-900 Series -- Real Estate
- **4-900-00 General**

UFC SERIES 5 -- SOFTWARE AND TOOLS *(Multiple / Cross Discipline Working Groups, including Planning and O&M software and tools)*